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3 Ecological Consulting used the modeling technique, OSRISK, developed by the
4 National Oceanographic and Atmospheric Administration (NOAA) Hazardous Materials
5 Modeling Group to describe this process. A spill is represented as a cluster of
6 independently moving points (called Lagrangian elements), each one representing a
7 fraction of the entire spill volume. The basic model output for a given oil spill scenario is
8 a tracking of the position of the Lagrangian elements at 30-minute intervals within the
9 Bay. The area affected by an oil spill varies greatly with the volume of the spill, age of
10 the spill, and the wind and current conditions that prevail during the course of the spill.
11 OSRISK simulated the process of spreading using random diffusion factors which were
12 based on the real hydrodynamic modeling incorporated by the data from the University
13 of California at Davis.
14
15 Because both crude and refined petroleum products typically contain a substantial
16 portion of volatile compounds, the volume of a spilled product that remains in the
17 environment will decrease with time. Most products are composed of a number of
18 fractions that vary greatly in terms of their volatility. Light, volatile fractions usually
19 disappear within hours, while heavier, tarlike fractions may persist for years. The model
20 OSRISK describes this process. Spilled volume are divided into component fractions,
21 each component having an estimated half-life. At the time when a Lagrangian element
22 is released, it is assigned to one of the oil fractions. The number of Lagrangian
23 elements assigned to each fraction is proportional to the relative volume of that volatile
24 compound and has a specific probability of disappearing.
25
26 A wide range of crude oils and refined products are shipped into and out of the Bay, as
27 such crude oil and products were divided into two general classes: light products and
28 crude oil. Simulations of light product spills were based on the characteristics of
29 kerosene, a typical light refined product. This type of product volatilizes relatively
30 rapidly, and little remains within 24 to 48 hours after a spill occurs. Crude oils also vary
31 widely in their composition, but typically contain a substantial amount of highly
32 persistent tar-like compounds. While the lighter fractions of a crude oil spill may
33 disappear over a period of several days, the remaining heavier fractions may last from
34 several weeks to several months, floating at or near the water surface. Initially, these
35 heavier fractions may emulsify with sea water to form a substance called mousse. In
36 this state, the effective volume of oil can actually increase in spite of the evaporation of
37 the more volatile components. The remaining oil may eventually form into highly
38 persistent tarballs or mats. All of these processes depend not only on the composition
39 of the spilled crude oil, but also on weather conditions and sea state. Therefore, crude
40 oil was modeled as persistent, and each Lagrangian element was tracked until it
41 beached or moved outside the model domain. Because spills within the Bay can be
42 deposited on land within a few days, they were tracked by the model for up to two
43 weeks. Because spills along the tanker routes outside the Bay can take several weeks
44 to make landfall, those model runs were tracked for up to 30 days.
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